Seminar/Talk

An Electrifying Farewell: How Evaporating Drops Charge and Explode

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Host: Scott Waitukaitis

When a drop evaporates, it is easy to think of it as a purely thermal and mass-transfer process. In reality, subtle electrohydrodynamic phenomena can transform its quiet demise into a highly charged and sometimes violent event. In this talk, I will explore how sessile water drops spontaneously acquire and redistribute electrical charge during evaporation, leaving behind intricate bipolar surface charge patterns [1]. Under certain conditionssuch as when contact-line pinning is eliminatedthe shrinking drop can accumulate enough charge to approach its electrostatic stability limit. At this point, electrostatic repulsion overwhelms surface tension, triggering Coulombic explosions and fine spray ejection [2, 3]. These findings reveal evaporation as a rich playground for soft matter physics, where thermal, hydrodynamic, and electrostatic forces converge to produce surprising dynamics.[1] N. Singh, A.D. Ratschow, N. Aslam, D. Daniel, Bipolar surface charging by evaporating water droplets, https://arxiv.org/abs/2508.08884[2] M. Lin, P. Zhang, D. Daniel, Exploding droplets on lubricated surfaces, https://doi.org/10.21203/rs.3.rs-4486603/v1[3] https://www.youtube.com/watch?v=F0F8P23DUo0

Thursday, October 23, 2025 11:00am - 12:00pm
Office Bldg West / Ground floor / Heinzel Seminar Room (I21.EG.101)

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